

components, and which provides for upgradeability of the electrical system components of both new and used vehicles to incorporate self-diagnostic capacity without altering the original electrical system wiring. Additional benefits include the ability to customize new applications for vehicle wiring systems, by virtue of the small size and configuration of the solid state relay housing, and without the need for incorporating large printed circuit boards and housings.

[0038] The present relay also will operate with other off the shelf components (not shown), thus reducing tooling investment. Still additional benefits include silent switching of the relay as well as avoiding the necessity of having to replace such mechanical parts (resulting again from the absence of electro-mechanical switches), visual indication of circuit states (again red LED 64 or yellow LED 66), intelligent diagnostics for sensing partial loads when the fuse is sized to the load (circuit 114), and the ability of the relay to function for all load values sized to the fuse and for protecting the circuit.

[0039] Having described the presently preferred embodiments, it is to be understood that the invention may be otherwise embodied within the scope of the appended claims.

[0040] What is claimed is:

1. A self diagnostic solid state relay, comprising:

a three dimensional housing enclosing a printed circuit board;

a field effect transistor, at least one female circuit board terminal, and at least one LED element being electrically communicable with a first side of said printed circuit board, said LED being viewable from an exterior location of said housing;

a fuse engageable with said at least one female terminal through an opening defined in said housing;

a plurality of male circuit board terminals being in electrical communication with a second side of said printed circuit board and extending from further selected exterior locations of said housing; and

a first circuit switching condition resulting in a first illuminating depiction of said at least one LED element and indicating an open circuit operating condition of said relay, a second circuit switching condition resulting in a second illuminating depiction of said at least on LED element and indicating a partially open circuit operating condition.

2. The relay as described in claim 1, said at least one LED further comprising first and second LED elements electrically communicable with said circuit board and viewable from respective first and second exterior locations of said housing.

3. The relay as described in claim 2, said three dimensional housing having a specified shape and size and including at least a top face, said first and second LED elements being visible from opposite edge locations of said top face.

4. The relay as described in claim 2, said first LED illuminating according to a first selected color and upon occurrence of said open circuit operating condition, said second LED illuminating according to a second selected color and upon occurrence of said partially open circuit condition.

5. The relay as described in claim 3, said field effect transistor further comprising a MOSFET transistor.

6. The relay as described in claim 1, said at least one female circuit board terminal further comprising first and second female terminals, said fuse further comprising first and second spaced apart and extending blade portions engageable, respectively, with said first and second female terminals.

7. The relay as described in claim 5, further comprising an over-current protection device in operative communication with an output of said MOSFET, said first LED being connected in parallel configuration with said current protection device and emitting said first depiction upon said current protection device ceasing to pass current.

8. The relay as described in claim 7, said current protection device further comprising a fuse.

9. The relay as described in claim 5, further comprising a differential amplifier electrically communicating in parallel with an over-current protection device.

10. The relay as described in claim 9, further comprising said differential amplifier multiplying a voltage present across said current protection device and outputting a representative signal to a comparator.

11. The relay as described in claim 10, further comprising said second LED being connected to an output of said comparator, and whereupon said comparator receiving a signal from said differential amplifier which meets a predetermined threshold, said comparator switches state so that current passes to said second LED and emits said second depiction

12. The relay as described in claim 1, said three dimensional housing further comprising a substantially cubicle shape.

13. A self diagnostic solid state relay, comprising:

a three dimensional polygonal shaped housing enclosing a printed circuit board;

a MOSFET field effect transistor, a pair of female circuit board terminals, and a pair of LED elements being electrically communicable with a first side of said printed circuit board, said LED elements being viewable from an exterior location of said housing;

a fuse including first and second spaced apart and extending blade portions engageable, respectively, with said first and second female terminals through openings defined in said housing;

a plurality of male circuit board terminals being in electrical communication with a second side of said printed circuit board and extending from further selected exterior locations of said housing; and

a first circuit switching condition resulting in a first illuminating depiction of said first LED element and indicating an open circuit operating condition of said relay, a second circuit switching condition resulting in a second illuminating depiction of said second LED element and indicating a partially open circuit operating condition.